The Electric Arrangements of an Observatory.

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A system of electric connections for the numerous instruments has been evolved at the Perth observatory of so simple and convenient a character that a description may be interesting and perhaps useful, especially to those who contemplate establishing a new observatory.

There is only one sidereal clock and one battery used for all purposes, such as chronographs, clock dials, clock control, equatorial control, chronograph control, transit keys, and small electric lights.

The battery consists of two large accumulator cells having an E.M.F. of 4 volts. There are in reality two of these used alternately, so that one may be always available. It is found advisable to change the battery at 9 a.m. daily, and to recharge the one not in use. The charging is performed very simply by means of a motor transformer, worked from the ordinary electric light supply current.

By means of a three-way switch either battery can be turned on or off, or connected with the charging transformer, instantly.

From the battery a pair of heavy mains are run round the buildings and connected to a pair of terminals in each room, wherein any instruments which require an electric current are located. These terminals are labelled A and B.

From the contacts of the sidereal clock a current passes through a relay, and the contacts made by the armature of this relay practically indicate the adopted seconds of the clock. It has been considered advisable, in the case of the clock contacts only, to use a separate battery, and two cells of the gravity type are found to give sufficient current. But even in this case a switch has been provided for substituting the current from A B if the gravity battery is out of order.

One of the terminals of the secondary contact of the relay is connected to A, and the other to a third main wire which runs round all the buildings and is labelled C. The function of the clock relay is thus to make a momentary connection between A and C at every beat of the sidereal clock.

We have thus, in every instrument room, the three terminals A, B, and C, and from these all necessary connections can be made. Thus, for a chronograph or clock dial, wires must be run direct from C B, and this gives an electric impulse every second, since C and A are joined once a second by the sidereal clock relay. For an instrument which works by means of a key, or any form of hand control, wires must be run from A B. If a chronograph be of a

single pen type, *i.e.* if both the clock beats and the key taps are to be registered by means of the same electro-magnet, it will be necessary to introduce a relay; for otherwise the key will connect A and C, and will send an extra impulse along the clock circuit at every tap. In this case the primary terminals of the relay are connected with C B direct, and the secondary with A B through the chronograph. The secondary of the relay is thus placed in parallel with the key.

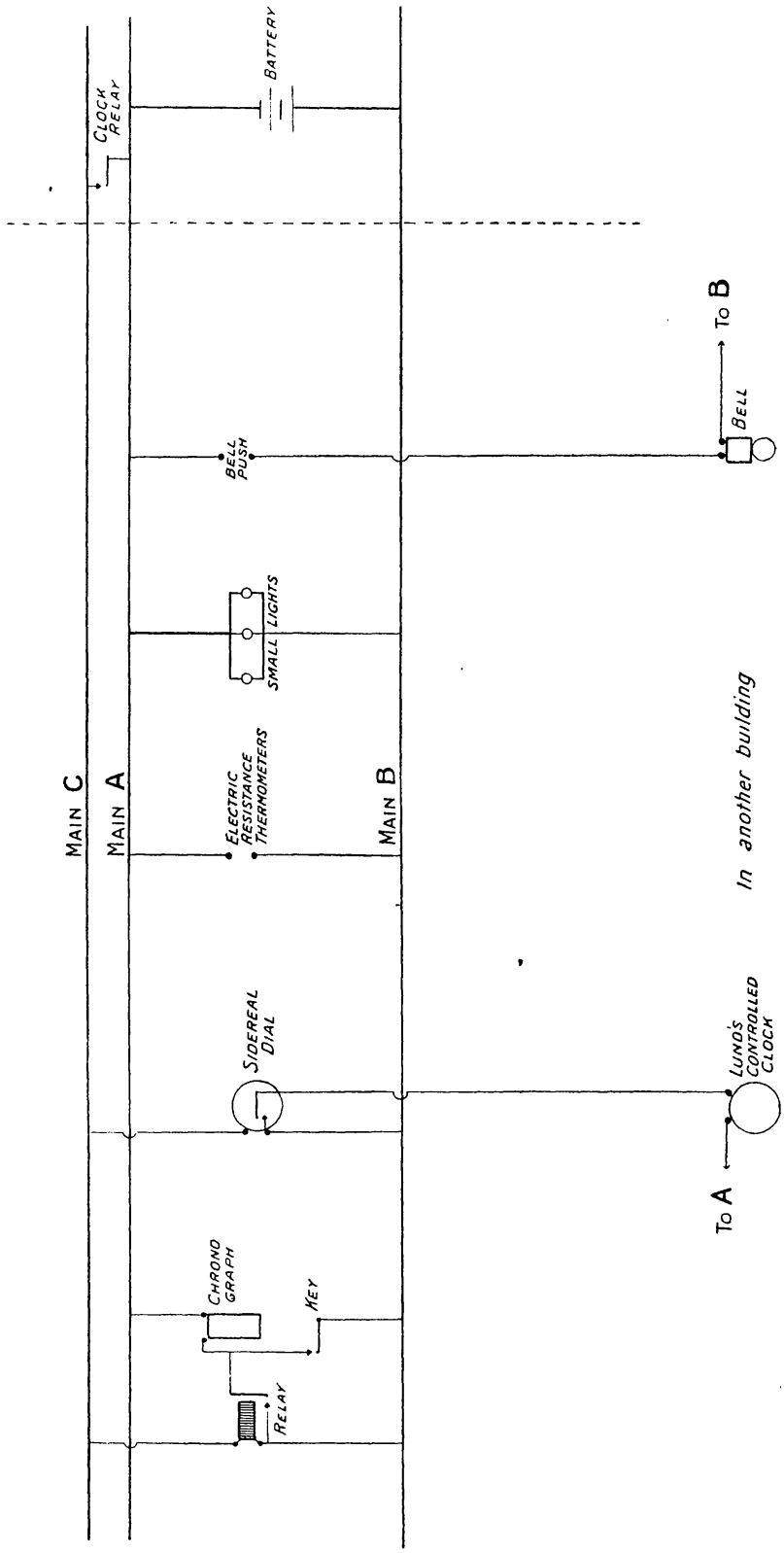
It may be mentioned that one of these relays is used as a key for transmitting clock beats in determining differences of longitude.

The system is especially convenient when it is desired to control an instrument in one building by means of a key or instrument in another building. For instance, there is a clock dial in the transit room, worked from the sidereal clock by simply connecting its terminals with B C. This dial contains a pair of contacts which are joined for a couple of seconds at each sidereal hour. These are required to control, by means of Lund's clips, a clock keeping sidereal time in another building. The connections are very simple. One of the primary contacts of the dial is already connected with B. It is now also joined to one of the secondary contacts. The other secondary is connected to a single line wire which leads to one of the terminals of Lund's control, and the other terminal is joined to the nearest A. The arrangement is shown in the diagram. Even the line wire might be dispensed with and an earth used if this instrument only were concerned, but it will be found advisable to keep away from earth connections entirely.

The accompanying diagram gives a rough sketch of the manner in which the system is used, but conveys no idea of the number of instruments which may be connected. At the Perth Observatory the following are all worked by the one battery :—

Two sidereal dials.
Three sidereal chronographs.
One mean time chronograph.
Three transit keys.
One complete longitude system for short distances.
One Lund's controlled clock.
One mean time multiple relay.
One electric recorder (for platinum thermometers).
Two complete Grubb's controls (Astrograph and Chronograph), using the sidereal clock instead of an auxiliary pendulum.
One control for mean time clock.
Several small lamps on instruments.
Two sounders for beating seconds in dark rooms.
Four call bells.
Two alarm bells on Astrograph.

All electric connections are, in fact, worked from the A B C terminals except the hourly current from the mean time clock.



Even that is connected through A B to the multiple relay, but thence the signals have to be distributed outside, and the observatory is only supposed to make a contact once per hour,—each outside user supplying his own battery. We ourselves take one of these circuits and run it through various meteorological instruments, fire a gun, and control a public clock, but for this purpose Leclanché batteries are used.

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